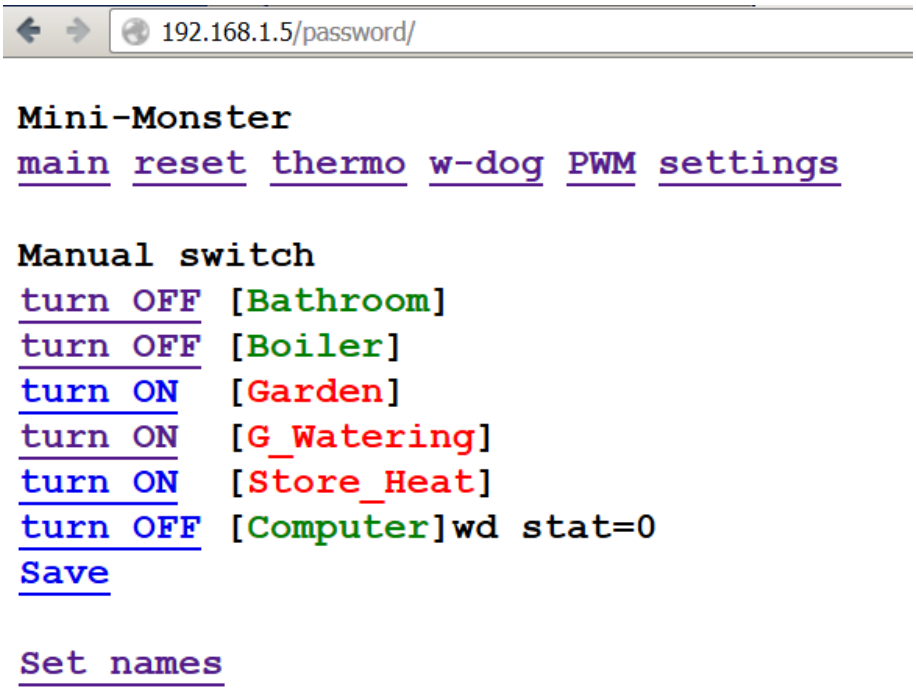
User's Manual
for remote control, automation and monitoring Module «Mini-Monster32»

v. 1.3 English

§ 1. About the Module – general information

The Module is based on microcontroller (by Atmel). The Module can be connected to standard IEEE 802.3 Ethernet network. The Module has mini-web-server, with simple and friendly web-interface, working over standard TCP/IP v.4 protocol.



There are six outputs on the Module for user to connect relays (5, 12, 24 V) for electric load control[1]. There must be the same power supply to the Module and relays to work properly.

1 Relays are not included

Electric load also can be connected straight to the Module without any additional power keys if the Module can carry load's amperage (see § 2).

Module's control outputs are Darlington transistor based with connection to «-» («ground») - most for relays, 300 mA, mutual power source for relay or other power key and the Module;

Possible ways to use the Module:

- automation and monitoring tasks with any digital or analog sensor readings (thermostat, humidistat, ventilation control, etc.);
- remote control over TCP/IP, Ethernet or Internet, of power keys or control elements (buttons, electric motors etc.);
- TCP/IP availability control, Ethernet watchdog;
- any task that can be algorythmized and/or is implementable on microcontroller:
    - PWM control;
    - remote information input (by contact closure);
    - RS232 (UART, USART) to Ethernet bridge;
    - and many others.

Functions of the Module that are included in default firmware:

- manual control of 6 (six) outputs (on/off);
- thermostat function: detached automatic control of 6 (six) outputs with using form 1 (one) to 6 (six) temperature sensor readings;
- watchdog function: ICMP-monitorning («ping») of 6 (six) hosts in TCP/IP v4 network, with «hard-reset» when inaccessible;
- reset function: quick manual hard-reset of 6 (six) outputs with mutual interval;
- PWM function: controlled real-time PWM signal generation to 1 (one) separate output.

§ 2. Technical specifications of the Module

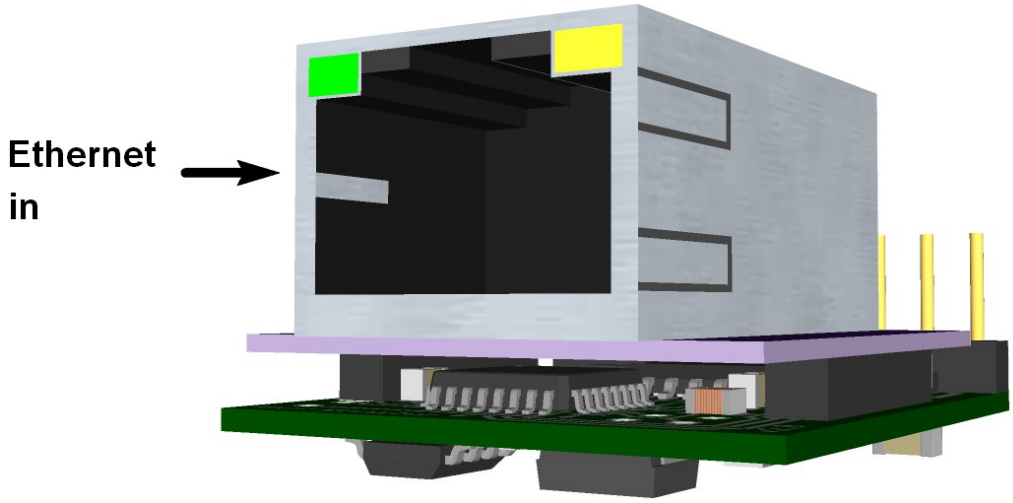
Size (W*H*D)	26*22*30 mm
V_{in}	5-24 V DC
Consumption current	210 mA (5V)
Ethernet	10Based-t
Relay driver	ULN 2003
Outputs amount	6
Max load power consumption	300 mA ULN
Relay voltage	= Vin
Thermal sensors can be connected[2]	6
Thermal sensors type[3]	digital, analog
Thermal measurement range	-55 ... +99 C°
Thermal measurement accuracy	0,1 C°
Operating temperature of the Module	+10...+40 C°
Operating humidity level	20%...80%

2 Sensors are not included.

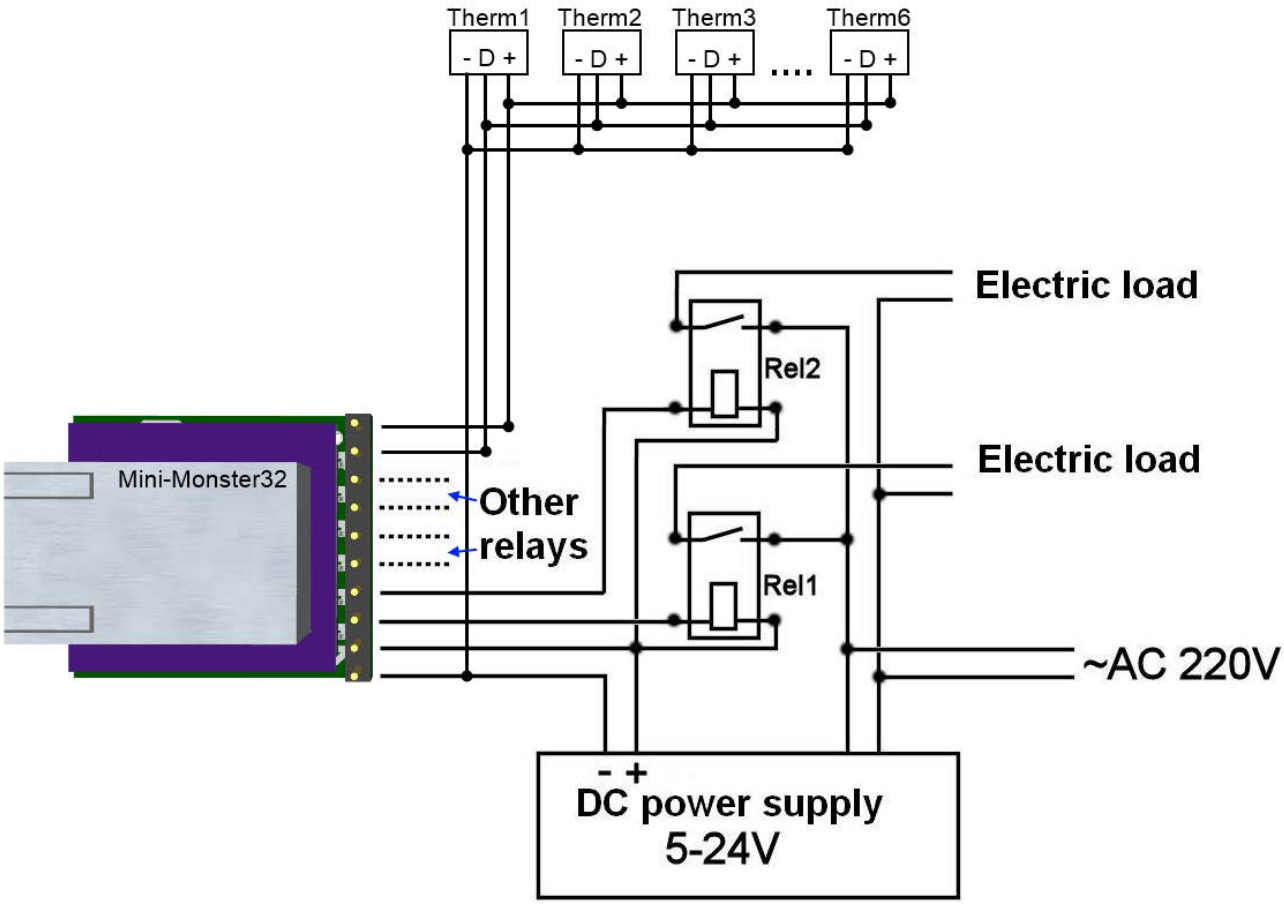
3 Originally designed for DS18b20 so that type of sensor can be just connected and then will work without any other actions.

§ 3. Schemes and connections

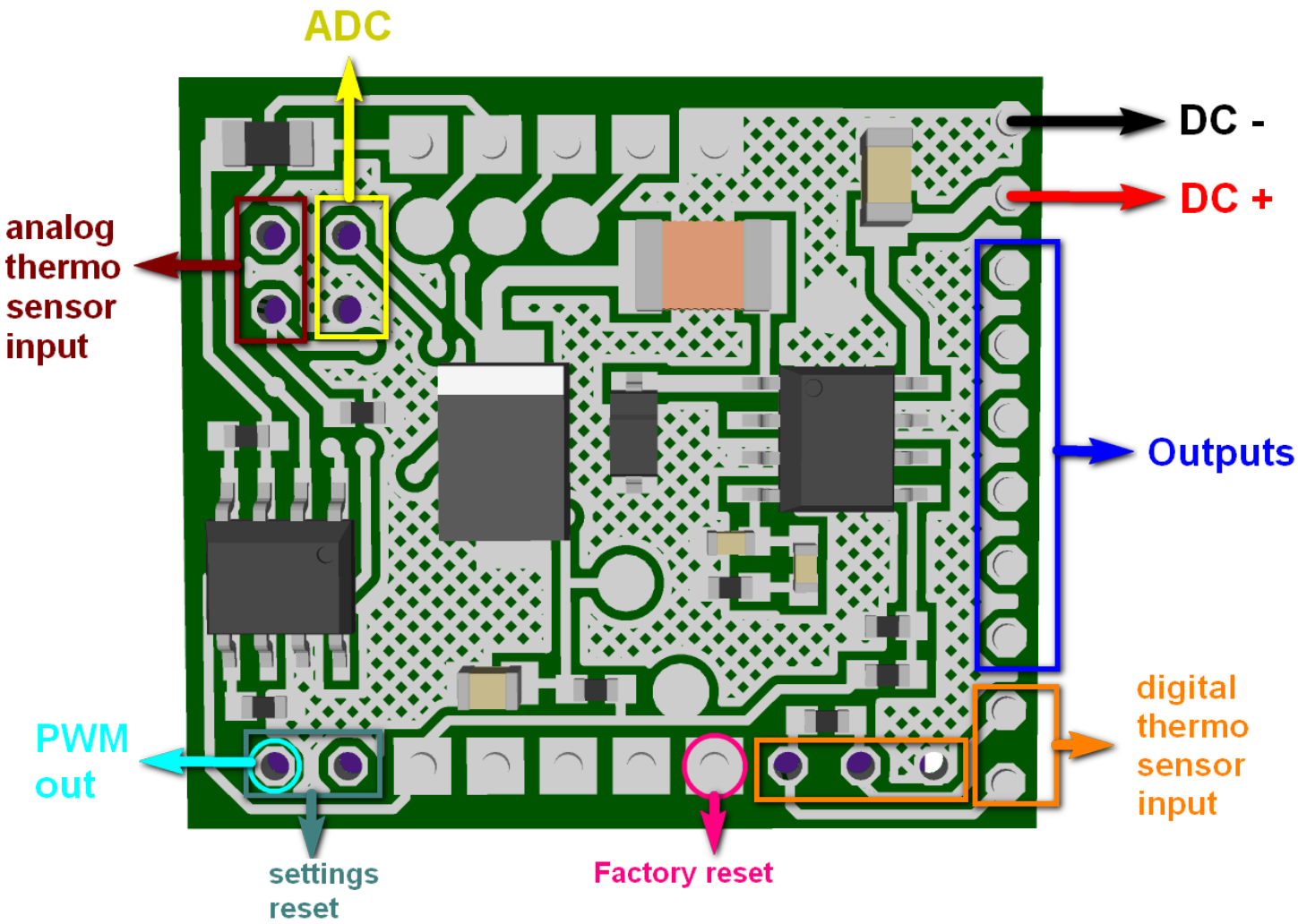
General view of the Module, from the front of Ethernet socket



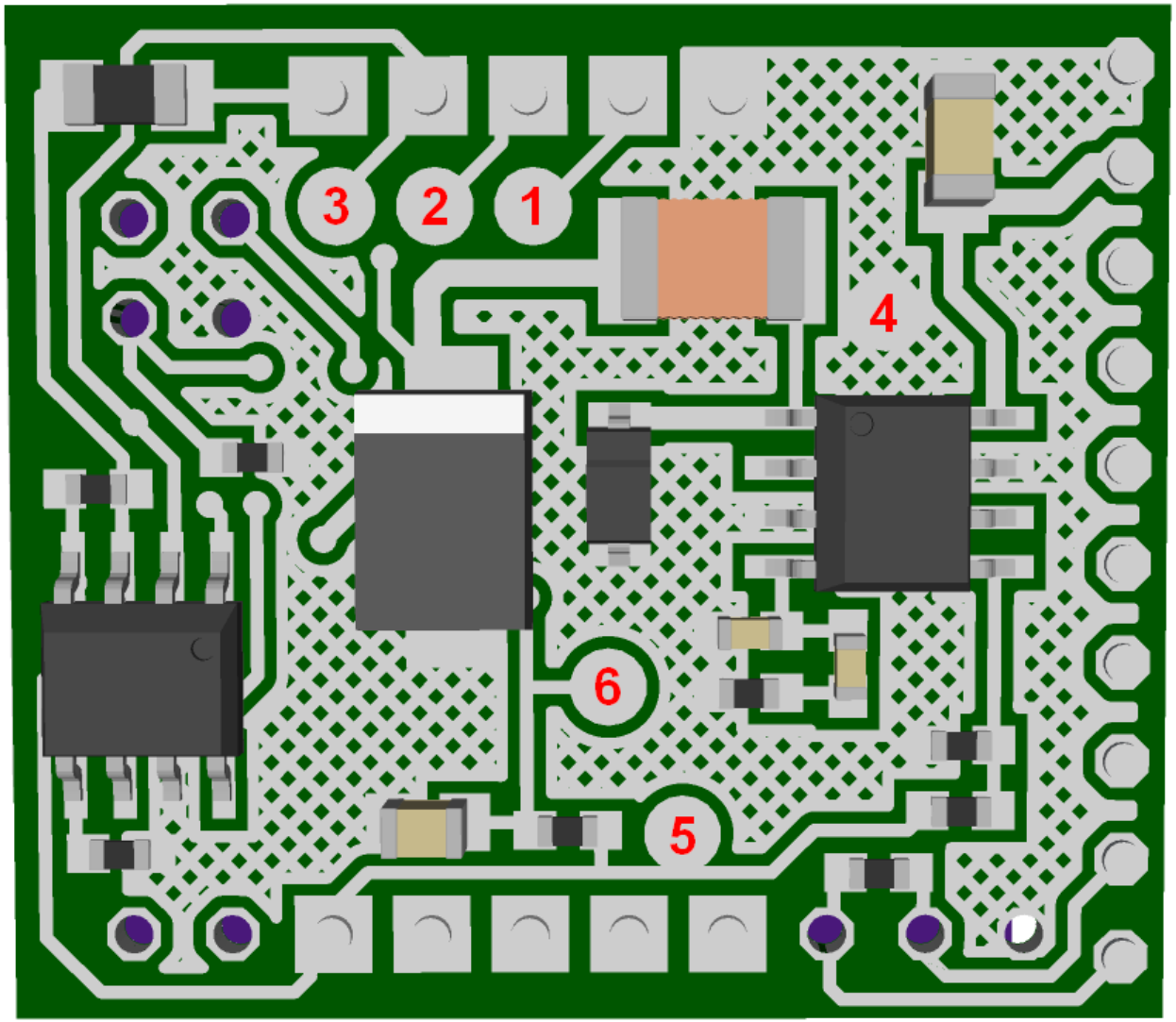
Connection diagram



General inputs and outputs map (bottom view)

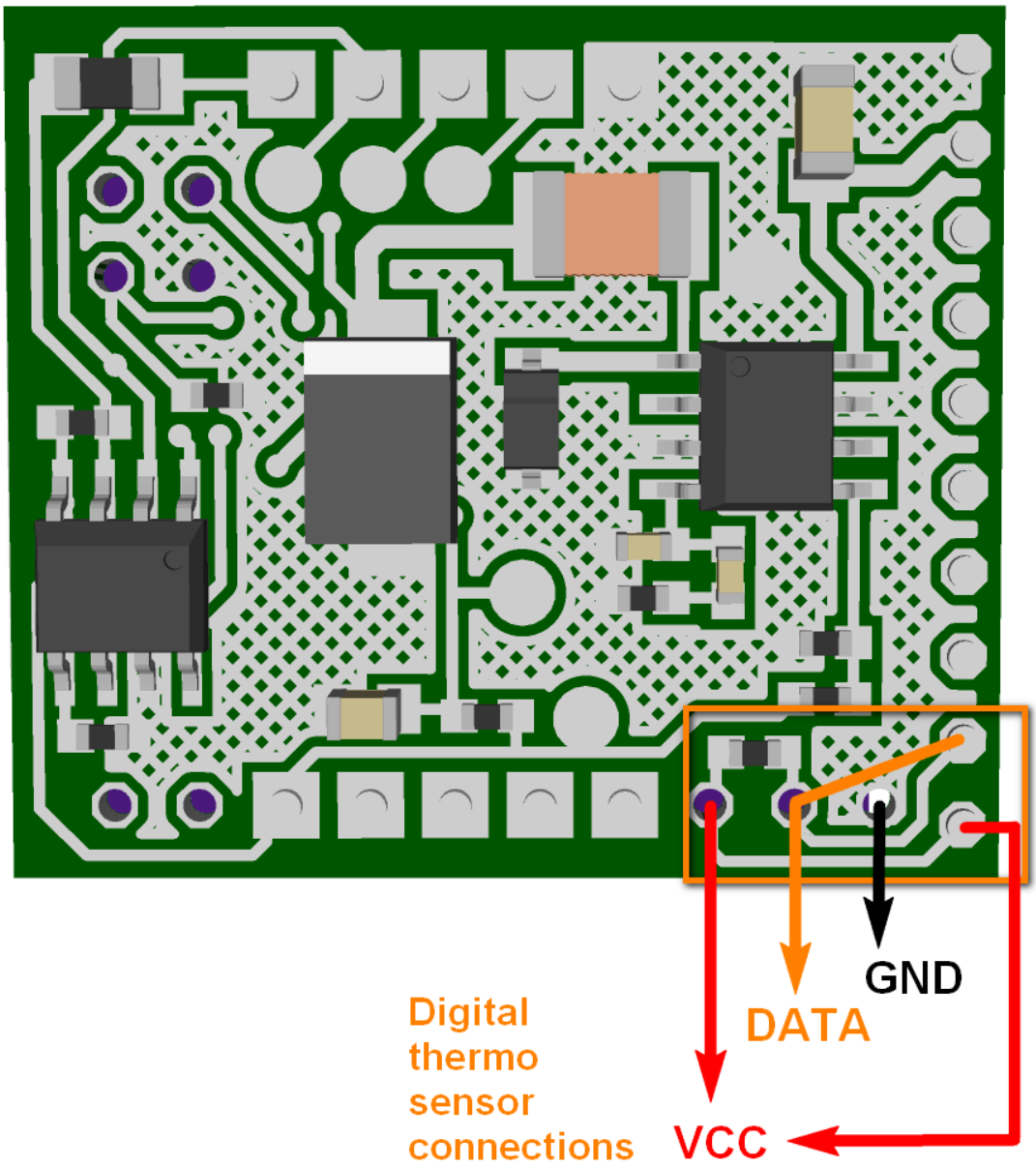


Service pads and pins (bottom view of the Module)



1.MISO
2.MOSI
3.SCK
4.GND
5.VCC
6.RESET

Digital temperature sensor connection



§ 4. Web-interface and controls

The Module has web-interface, and can be accessed via TCP/IP after connecting to Ethernet and power supply.

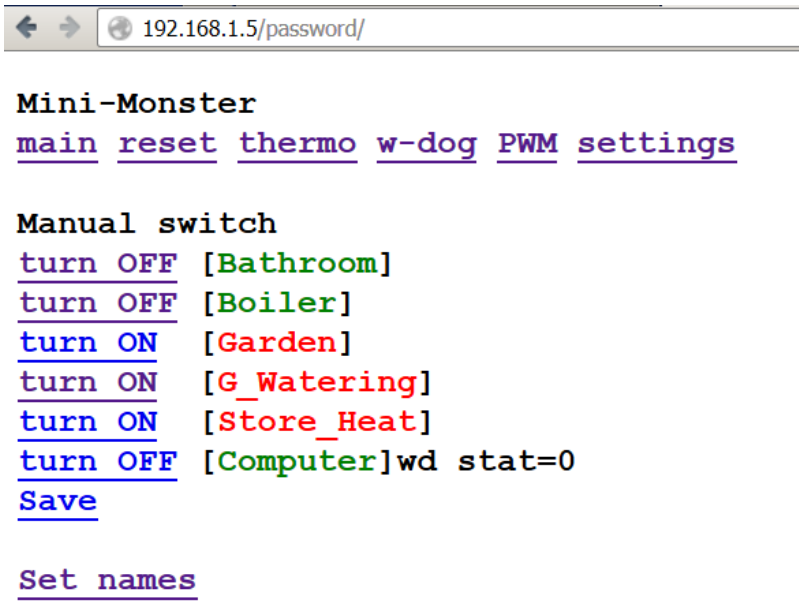
Defaults are:

- IP: 192.168.0.12
- Password: password
- MAC: F0-F1-09-E4-01-FF

  Note: by default, all Modules have the same MAC-address. If there will be more than one Module in local network, unique MAC for each Module will be assigned.

So after first switching-on the Module can be accessed at address http://192.168.0.12/password

Web-interface general look (example):



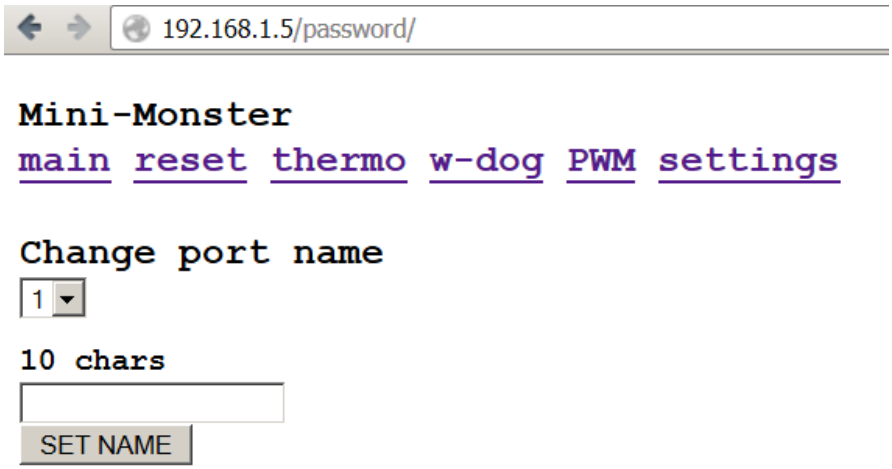
Control sections:

MAIN – displays states of outputs and provides manual switch outputs functionality.

Color of output number shows the state at the moment (green - on, red - off).

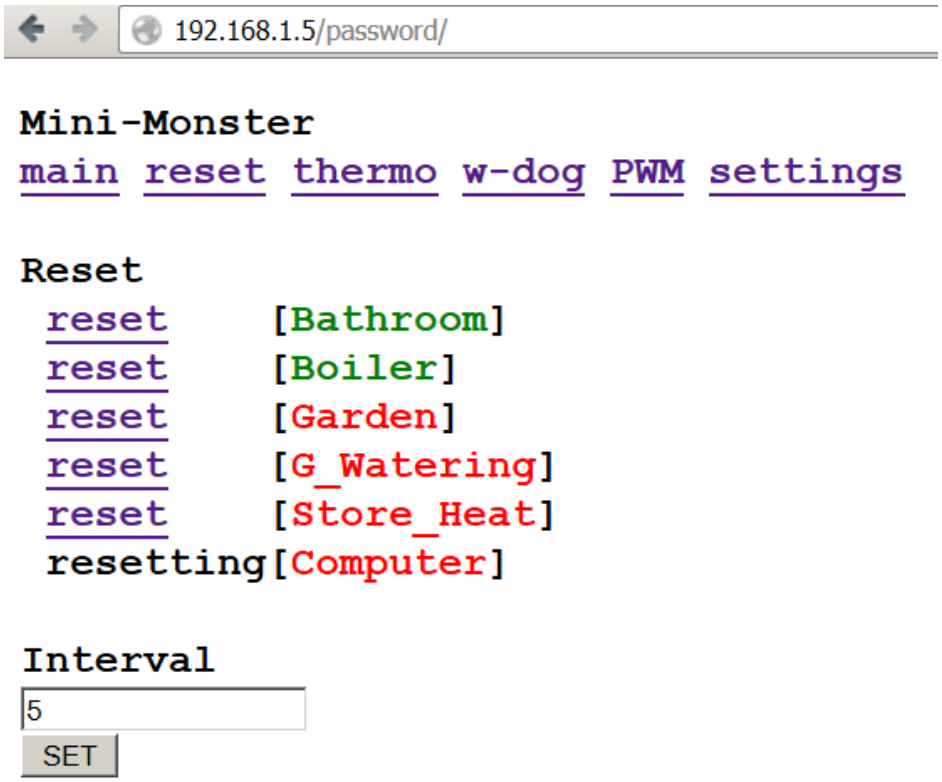
If there is reset by «watchdog» or «reset» functions, «resetting» will be displayed instead of switch; manual control is disabled while resetting.

«Set names» item contains output naming functional: user can set local names for each output, name can contain A-Z, a-z, 0-9 characters, 10 char max.



«Save» item allows to save current states of outputs as the default state (after reset, for example, outputs will automatically be returned to a given state).

RESET – allows to make quick double inversion of output state, example ON-OFF-ON.



Interval of this operation is mutual for all outputs; it counts in seconds, max 255 seconds.

If «Thermostat» is activated for output, there will be «T-mode» string instead of reset switch; reset in thermostat mode is impossible.

If reset was made user here or by «watchdog» function, «resetting» will be displayed instead of switch; reset will be disabled while resetting.

THERMO – provides thermostat functionality.

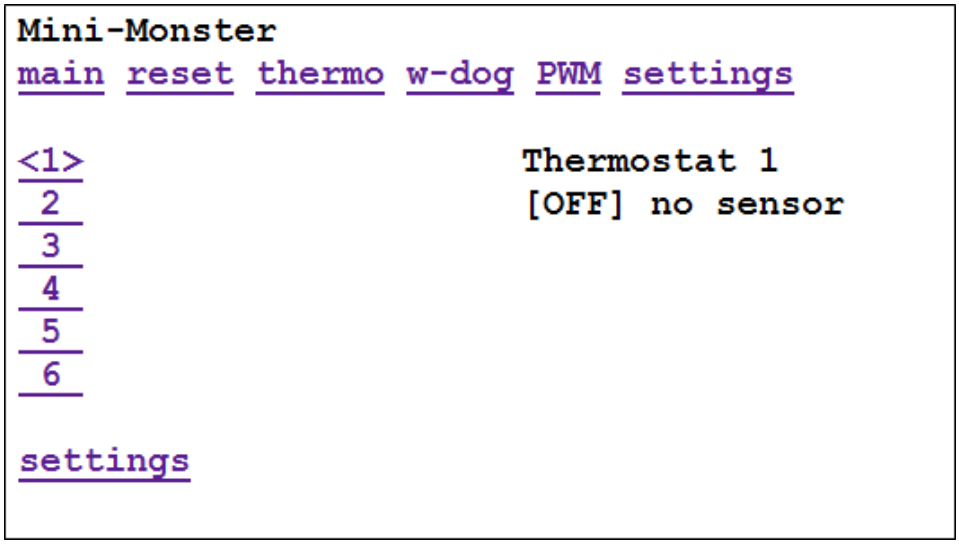
General information:

It's possible to connect up to 6 digital temperature sensors to the Module. Maximum cable length is 50 meters. We don't recommend to use the wire with diameter less than 0.5mm. You can enable «Thermostat» mode for each output of the Module. So, Module will automatically turn ON and OFF that output according to it's settings. Each sensor can be associated with multiple outputs simultaneously with different settings for each output (thermostat).

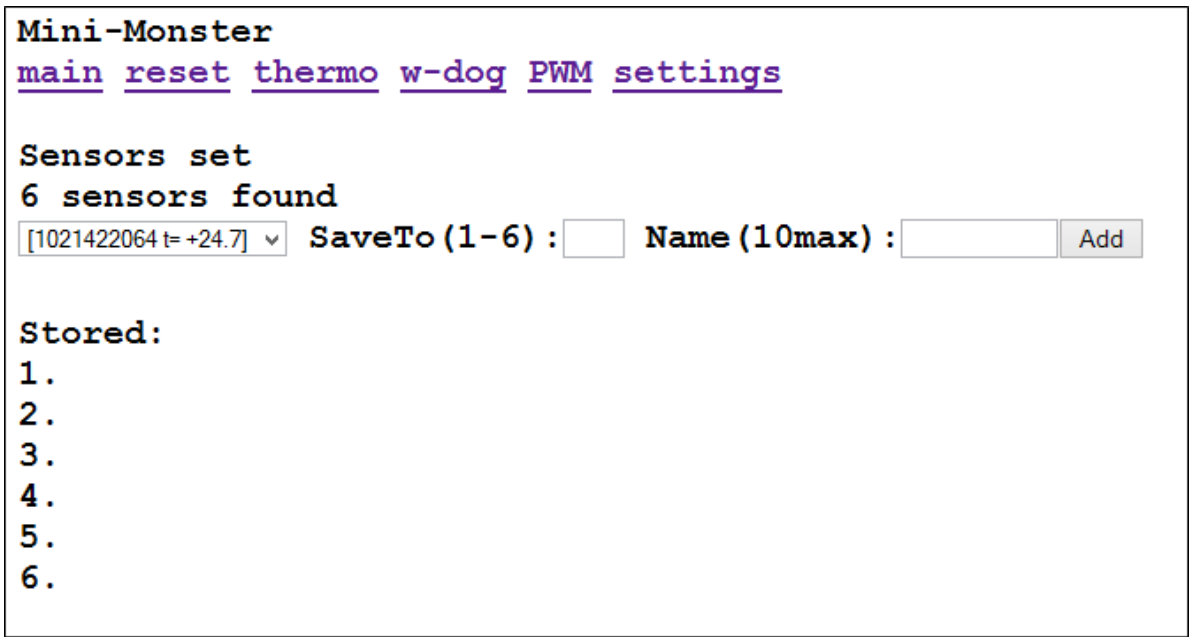
Example: Output 1 is controlling main boiler in the house and Output 2 is connected to emergency boiler. Sensor 1 is associated with both of them. Output 1 has 23C° setting and Output 2 has 6 C° setting. So when main boiler is working, temperature in the house is maintained on 23 C° level. But in case of main boiler failure when temperature falls below 6 C°, emergency boiler will be started to avoid water freezing.

All temperature values here are in Celsius C°.

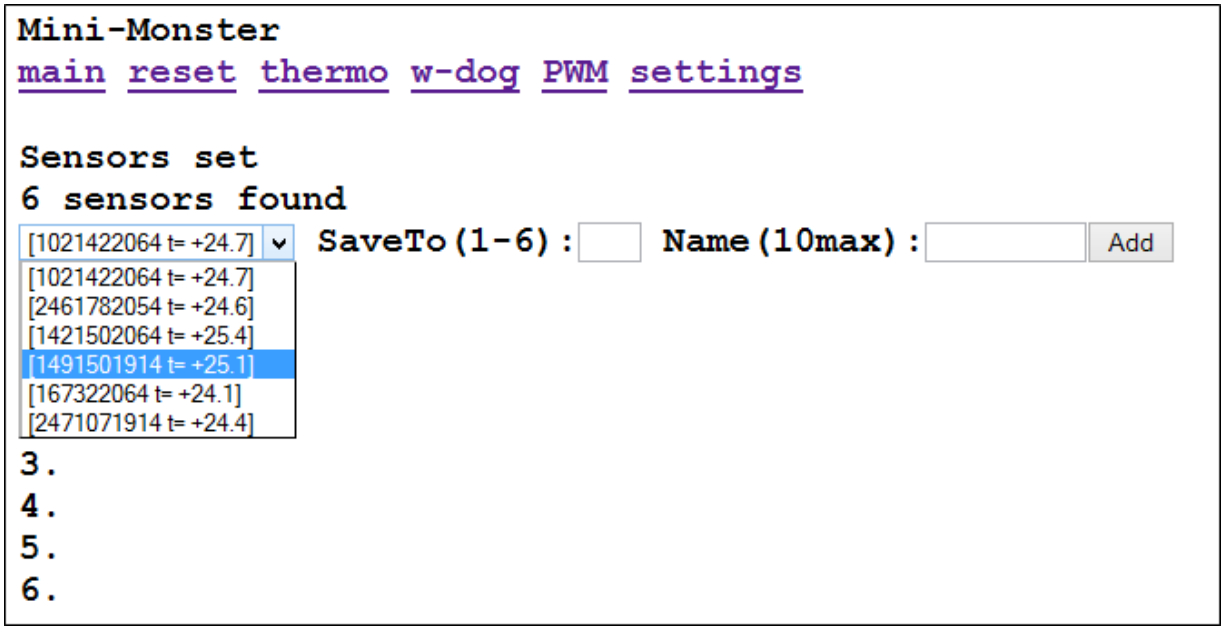
When the Thermostat page is open for the first time you will see the following page:



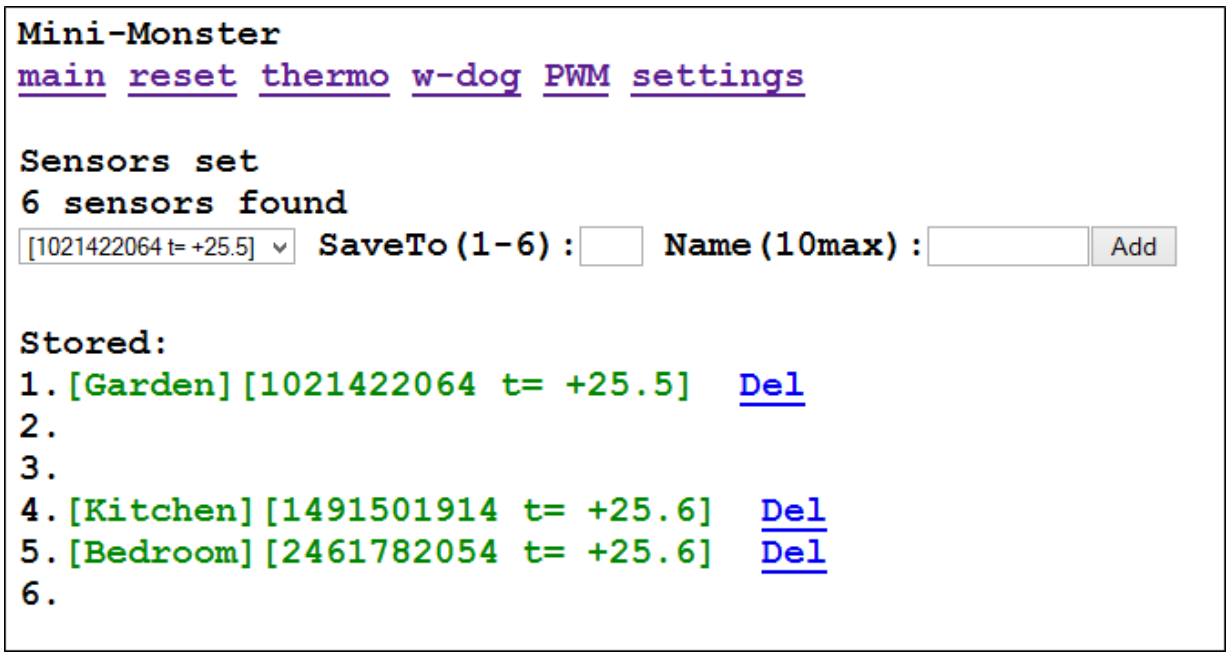
The numerical row on the right represents the Outputs of the Module. You must save found sensors to the memory first. The «**settings**» link below follows to «Sensors search and save» page. Click it.



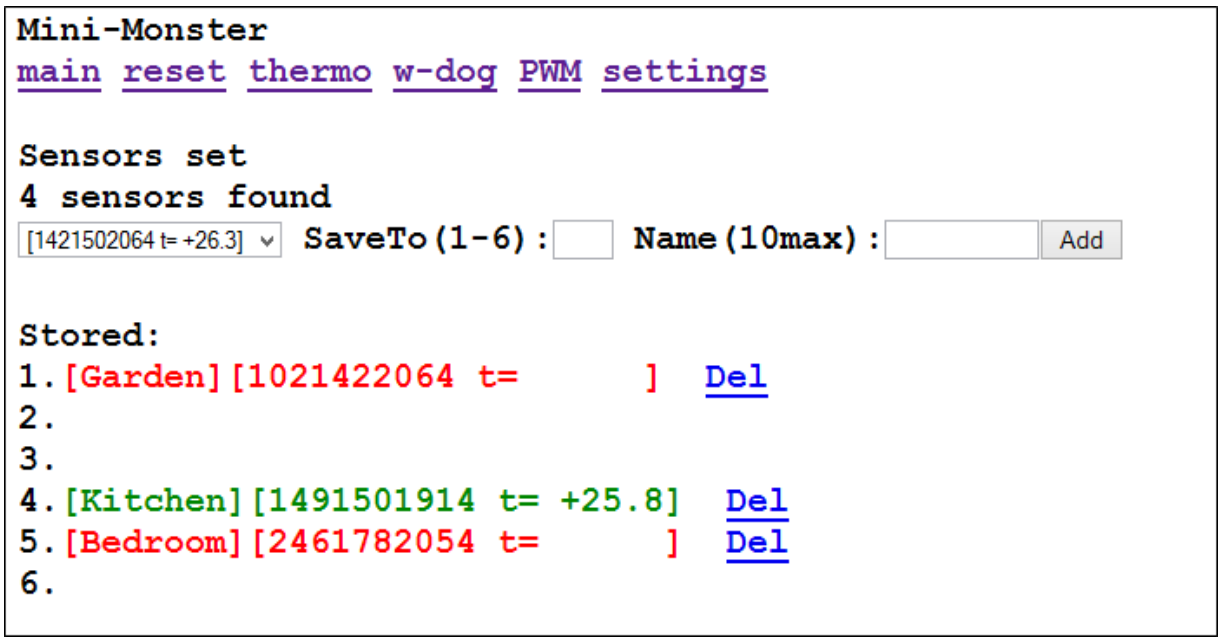
Number under the «Sensors set» label indicates how many temperature sensors are connected to the Module and working properly. There are all 6 sensors connected in this example. In the drop-list you can find all ID's and actual temperature data for each connected sensor.



To save the sensor you must select it in the drop-list, choose saving slot by inputting its number to the «**Save to**» field, and optionally choose it's name (10 symbols max). After a while the saved sensor has to appear in the list below. Repeat this operation to save all other sensors you want to. You can save one sensor multiple times to multiple slots, so saved sensors aren't disappear from the drop-list. You can delete any saved sensor by clicking on the «**Del**» link.

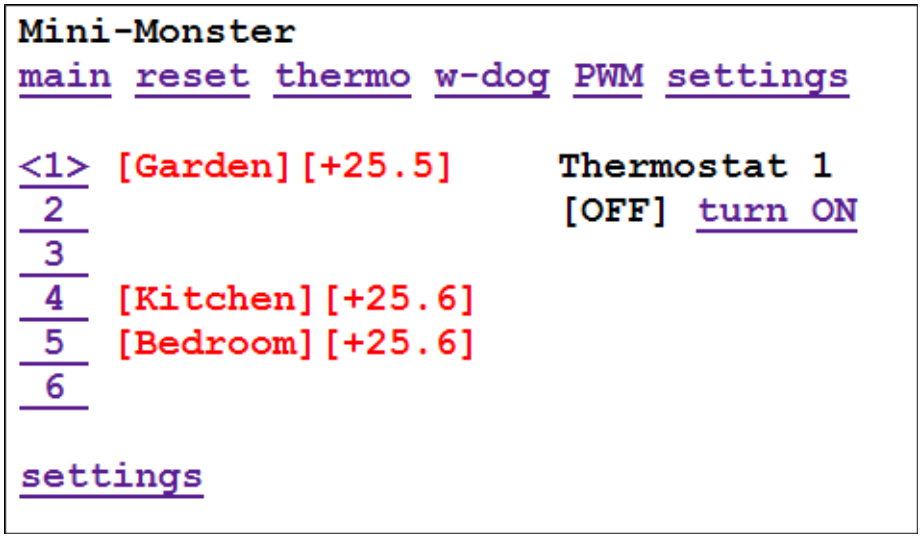


Saved and working sensors are colored green. If some sensors disconnected or failed after saving, the corresponding lines will be colored red.

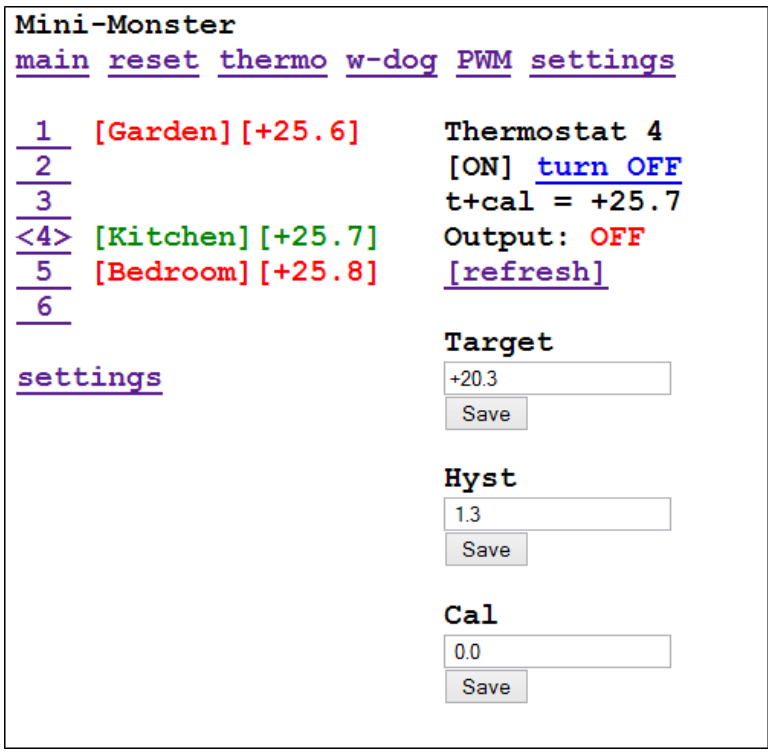


After sensors saving routine you can go back to the previews page by clicking «**Back**» button of your browser or using «thermo» link above.

You can see, that the all saved sensors appeared in the list at the right. You can see the name of each thermostat and current temperature readings. This temperature is absolute and hasn't been affected by the calibration value.



By the default setting all the thermostats are turned OFF (Red color). You can turn it ON the next way: 1. click on the number of the thermostat output you want 2. click «turn ON» link to enable thermostat. Enabled thermostats are colored in green.



String «**t+cal =**» displays the current temperature added with calibration value.

«**Output**» shows the current state of the output.

«**Refresh**» allows you to do manually refresh of the state.

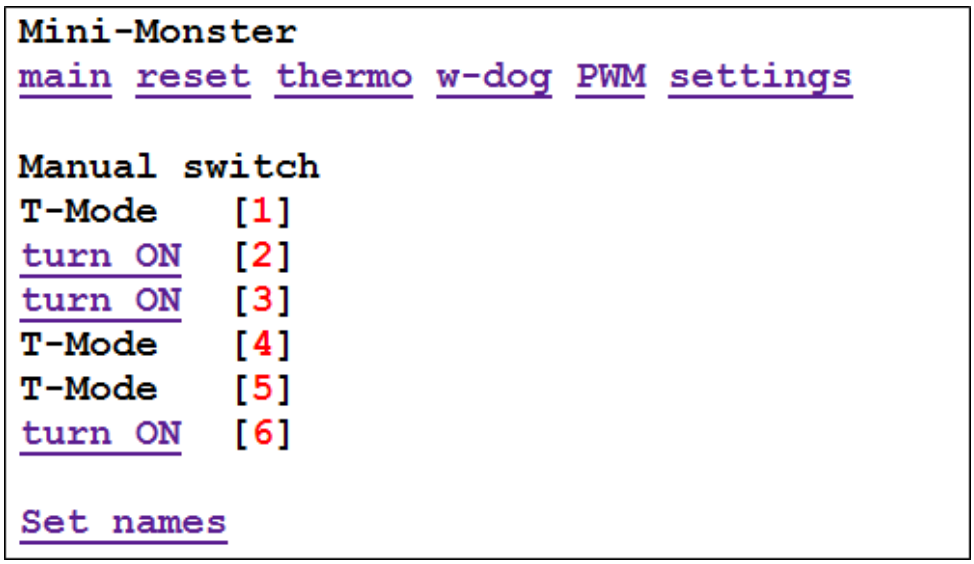
«**Target**» parameter is used to set the target temperature. The temperature can be set in both the positive (by default, that is, without the sign of the value or the «+» sign before the value) and negative (« - » sign before the value) ranges. Saving a given parameter is done by pressing the button Save.

«**Hysteresis**» parameter allows to specify a range of operating the output. The value is absolute and unsigned, tenth of a degree. This value will be added to the «Target» when high-threshold will be reached, and will taken away when the temperature lower threshold will be reached. For example, when temperature of 20 degrees is set, and a hysteresis is set 1 degree,

thermostat will switch output on on 19 degrees and will switch output off on 21 degrees.

Saving will be done by pressing the button «**Save**».

The last parameter allows you to adjust the sensor, as different sensors often has errors (usually linear) within two degrees. This value can be positive or negative. This parameter is always added to or subtracted from the data obtained from the sensor, and the «**t+cal**» string displays the corrected value. Thermostat also works with temperature corrected by this parameter. If the thermostat is turned on, the first switch in the MAIN section will be replaced with the inscription «thermo», and manual control of this output will be disabled.

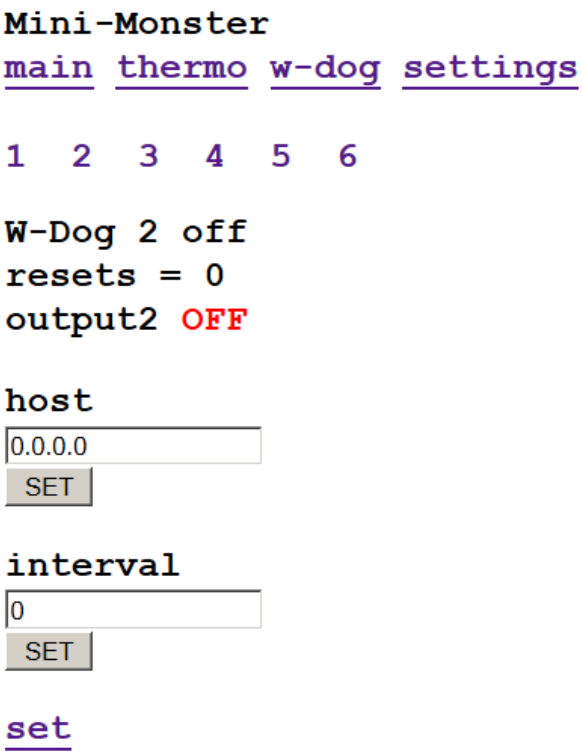


If one of the sensors fails during work of the Module, thermostats associated with it will be shut downed. If sensor isn't responding now there will be «XXXXX» mark instead of temperature data. <1> [Garden][XXXXX]

«!» mark near the name of thermostat's output means that this thermostat shut downed because off failure of the corresponding sensor.
4 ![Kitchen][XXXXX]
It will not turn ON again automatically after sensor was back to normal.

The Output can't work in «Thermostat» mode and in «Watchdog» mode simultaneously, so when you turn ON the thermostat, the watchdog mode on this output will be turned OFF (if it turned ON) and vice-versa.

W-DOG – allows automatic hardware reset for host in case it is not available in the Ethernet, whose AC or DC power supply can be controlled via Module's output and relay connected to that output.



Function provides monitoring and resetting 6 (six) hosts; each w-dog is binded to one output with the same number.

Navigation menu (numbers from 1 to 6 below main menu) provides access to all Watchdogs.

Below navigation menu an informational frame is located. It contains:

- info of function itself (is function ON or OFF) – 1st string;
- amount resets done by function – 2nd string;
- current output state – ON or OFF – 3rd string. If a name was set for output, it will be used; otherwise number will be used.

If target host in unreachable, NR (not reachable) will be added in the 1st string, for example: W-Dog 1 OFF (nr).

On main «W-dog» page address of target machine and interval can be set. Checking availability goes via TCP/IP through the ICMP (PING). The frequency of checking and additional parameters automation can be set here.

The function is **enabled**, if the parameter **«interval»** is non-zero. In this case, corresponding output in «Main» section will be supplemented with a string of reset statistics («W-dog stat = x»).

The string **«host»** specifies the ip-address of the host that will be monitored. The address format is xxx.xxx.xxx.xxx, for example 192.168.10.5. If the host was not found, «not found» will be displayed in «W-dog» main section, and uppercase «n» symbol will be displayed in «W-dog» navigation menu.

For monitoring hosts from non-local net, **«gateway»** option must be used; see «Settings» for details.

If the function is enabled, after the reset section resets statistic will be showed.

«Interval» parameter specifies the time interval in seconds after which the availability check will be performed. The range of values is from 1 sec. to 255 sec. 0 means deactivating the function.

To set another parameters, use **«set»** item.

«**Reset interval**» parameter specifies the time (in seconds) between switching output off and on (power-on reset). Can be set from 1 second to 255 sec., recommended for at least 2 seconds.

«**Lost before reset**» parameter determines the number of packets lost (no response for a request to the host)before the reset will be performed. For example, if «Ping interval» = 2, and «lost before reset» = 4, then reset will be

done in 2 * 4 = 8 seconds if no response from the host was got in this eight seconds. If at least one response is received, the no-response-counter will be set to zero. The parameter can have a value from 1 to 255 seconds.

«**Wait after reset**» parameter determines the check delay after reset. For example, if the computer is rebooted, it will be available in the network after approximately 2-3 minutes. At this time, computer will be inaccessible from network, and checking is useless. The parameter can have a value from 1 to 255 seconds.

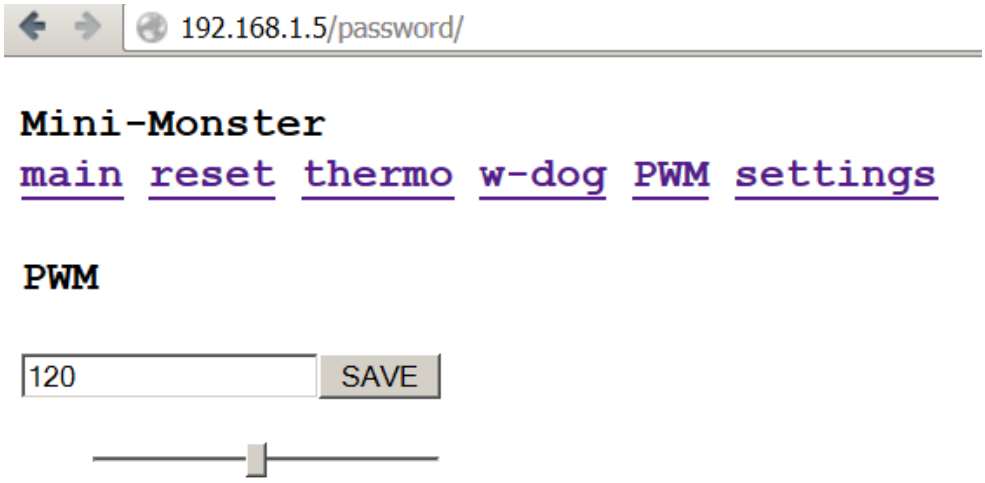
«**Failed resets**» parameter determines how many times the equipment can be resetted if the answers are not received after the restart. After the specified number of restarts, if there will be still no response from the host, Watchdog function will be disabled. The value can be from 1 to 255.

Important:

if more than 1 (one) host is monitored, we do not recommend using values of parameters less than: **interval** – less than 3 (three) seconds; **lost before reset** – less than 3 (three); **wait after reset** – less than 3 (three) seconds.

If not recommended values are used, web-interface may not function properly and large delays in web-pages loading process are possible. It will not affect proper functioning of watchdog function itself.

PWM – regulated live PWM-signal generator mode



Value can be set by field or slider, interval – from 0 (zero, off) to 255 (full power).

PWM-signal value is updating live (in real time).

To save value to non-volatile memory, use «Save» button.

SNMP

From firmware version 2.5 “Mini-Monster” supports SNMP protocol v.1 (RFC 1155, RFC 1157).

This function can be enabled in “Settings”.

GET and GETNEXT request types are supported. The Module has all its data in «Enterprise» space. «Trap» function is not implemented now.

“Mini-Monster”'s Enterprise OID – 43 (1.3.6.1.4.1.43)

Community string is the same as password to Module's web-interface.

Information that can be obtained from the Module by SNMP:

0. device_id – Module's name, oid 0, «String» format;

1-6. Module's output status, oid 1-6 (corresponds to output number), «integer» format, syntax: 1 – ON, 0 – OFF;

7-12. Watchdog reset stat, oid 7-12 (corresponds to Watchdog function number), «integer» format;

13-18. digital thermosensor temperature, oid 13-18 (corresponds to thermosensor number), «singed integer» integer, must be divided by 10;

19. analog thermosensor temperature, oid 19, «signed integer», must be divided by 10;

MIB's can be found at http://mini-monster.ru/index.php/en-US/dwnld-en.

SETTINGS – common Module settings

«**IP**» specifies the IP address of the Module in a local network. Default Address - 192.168.0.12.

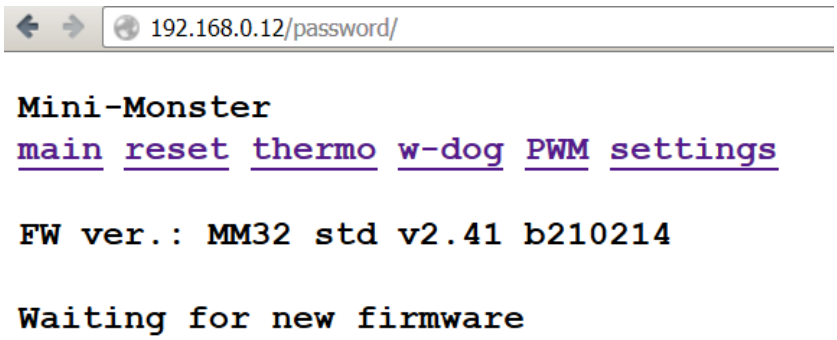
«**Gateway**» specifies the gateway in local network to allow monitoring of hosts that are located in different net or subnets. The address format is xxx.xxx.xxx.xxx, for example 192.168.10.1.

«**MAC**» specifies the physical MAC address of a unique Module. Not all values of hex are correct MAC addresses, so do not change unless necessary. Default – F0-F1-09-E4-01-FF.

«**ID**» specifies the name (just a label) of the Module. Default «MiniMonster».

«**Pass**» is the password to the Module. Default - «password».

«**Change firmware**» provide firmware changing functionality.



FW ver string indicates current firmware version.

To change firmware, special software must be used. It can be downloaded from official Project page, «download» section.

If there is something wrong with main firmware, emergency firmware will start automatically. In this emergency mode firmware also can be changed and recovered (see § 5).

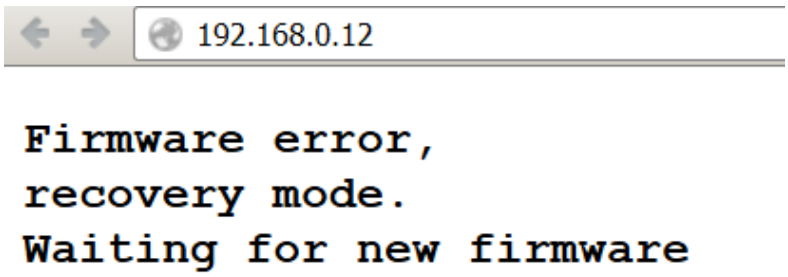
§ 5. Miscellaneous

Settings of the Module are stored in non-volatile (EEPROM) memory, so after the power settings they will be preserved. All the data is stored in EEPROM of the Module excepts Watchdog function statistics.

To reset the Module to the factory defaults, connect the pads when turning the Module on (see Section 3).

There is possibility to reprogram the Module by user who can do it by self. Programming can be accomplished by using programming pads and so-called «pogo-pins» or by soldering the wires to pads. Pads location is specified in paragraph 3.

There is possibility to set firmware defaults to the Module. When powering on the Module, certain contact (see § 3) must be connected to the «ground». Then emergency firmware will be loaded to the controller and start automatically.



In this mode firmware changing thru TCP/IP (via special software) can be used.

For a more accurate measurement of the temperature sensor is recommended to connect to the pigtail with the length of the unit at least 10 cm.

Do not recommended to use the Module at temperatures below +10 ° C and above +40 ° C. The Module was not tested long at this temperatures. If exploitation for the temperature measurement in not-recommended temps is needed, may use an extension cord to connect the temperature sensor.